

**CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD**

**REPORT TO THE LEGISLATURE AND THE GOVERNOR
ON
REGULATIONS TO CONTROL GREENHOUSE GAS EMISSIONS
FROM MOTOR VEHICLES**



DECEMBER 2004

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EXECUTIVE SUMMARY

Chapter 200, Statutes of 2002 (AB 1493, Pavley) directs the Air Resources Board (Board) to adopt regulations that achieve the maximum feasible and cost effective reduction of greenhouse gas emissions from motor vehicles. AB 1493 requires the Board to transmit the regulation to the appropriate policy and fiscal committees of the Legislature for review. The bill also directs the Board report to the Legislature and the Governor, and outlines several areas that the Board's report must address. This report is submitted in keeping with those requirements.

Over the 20th century, we have observed a rapid change in the climate that is attributable to human activities. The global mean temperature is warming at a rate that cannot be explained by natural causes alone. Human activities are directly altering the chemical composition of the atmosphere through the buildup of greenhouse gases. The past century has already seen changes in climate-related conditions in California such as average temperature (up 0.7°F), sea level (up 3 to 8 inches), spring run-off (decreased by 12 percent), and the timing of snowmelt and spring bloom (advanced by 1 to 3 weeks).

Projected future climate change may affect California in a variety of ways. Public health can suffer due to greater temperature extremes and more frequent extreme weather events, increases in transmission of infectious disease, and increases in air pollution. California's agriculture industry is especially vulnerable to altered temperature and rainfall patterns, and new pest problems. Climate change can adversely affect California's forest ecosystems and the Sierra snowpack that functions as the state's largest reservoir. Sea level rise and storm surges could lead to flooding of low-lying property, loss of coastal wetlands, erosion of cliffs and beaches, saltwater contamination of drinking water, and damage to roads, causeways, and bridges.

The State of California has traditionally been a pioneer in efforts to reduce air pollution. California likewise has a long history of actions undertaken in response to the threat posed by climate change. California action specifically to control greenhouse gases is strongly supported by the public. The July 2004 Special Survey on Californians and the Environment, conducted by the Public Policy Institute of California, found that eight in ten Californians support the state law that requires automakers to further reduce the emission of greenhouse gases from new cars in California by 2009.

In setting greenhouse gas emission standards, the staff performed a detailed evaluation of the technologies and fuels available to reduce vehicular greenhouse gas emissions, the reductions that could be achieved, and their cost. The evaluation of vehicle technology that formed the basis of the staff assessment was derived primarily from a comprehensive vehicle simulation modeling effort and a thorough cost analysis performed for the Northeast States Center for a Clean Air Future (NESCCAF) by consultants frequently used by the auto industry. ARB staff believes the NESCCAF study is the most advanced and accurate evaluation of vehicle greenhouse gas emission reduction technologies that has been conducted to date.

The staff technology assessment reviewed baseline vehicle attributes and their contribution to atmospheric climate change emissions, and evaluated technologies that have the potential to decrease these emissions. The technologies explored are currently used on some vehicle models, or have been demonstrated by auto companies and/or vehicle component suppliers in at least prototype form. Promising near-term technologies include cylinder deactivation, improved transmissions, variable valve timing and lift, turbocharging, gasoline direct injection, and more efficient, low-leak air conditioning.

Based on the technology evaluation, the regulation approved by the Board imposes climate change emission standards that are incorporated into the current Low-Emission Vehicle (LEV) program, along with the other light and medium-duty automotive emission standards. This approach was taken to ensure that manufacturers can meet the standards while continuing to provide the full range of vehicles available today. The standards phase in during the 2009 through 2016 model years, allowing changes to be made as part of the normal product improvement cycle. When fully phased in, the near term (2009-2012) standards will result in about a 22 percent reduction in greenhouse gas emissions as compared to the 2002 fleet, and the mid-term (2013-2016) standards will result in about a 30 percent reduction.

As part of its technology evaluation, staff estimated the average fleetwide incremental cost of control to meet the greenhouse gas emission standards. When fully phased in the near-term standards will result in an estimated average cost increase of \$367 for passenger cars and small trucks/SUVs, and \$277 for large trucks/SUVs as compared to the 2009 baseline vehicle. The fully phased in mid-term standards will result in an estimated average cost increase of \$1,064 for passenger cars and small trucks/SUVs, and \$1,029 for large trucks/SUVs. The staff analysis concludes, however, that these increased costs will be more than offset by operating cost savings over the lifetime of the vehicle. Using the average increase in vehicle prices associated with the fully phased-in regulation (2016), and an assumed fuel price of \$1.74 per gallon, staff calculated that the increased vehicle payment minus the reduction in operating cost would result in a monthly savings of about \$3.50 to \$7.00. At higher fuel prices, the monthly savings increase.

Automakers have criticized the staff technology analysis and cost estimates. The primary issues raised include the effect of the proposal on vehicle cost, vehicle availability, and vehicle attributes. Staff has reviewed the various issues raised by commenters and has not identified any concerns that lead to a change in the staff conclusions. Staff relied on a state of the art evaluation of technologies for greenhouse gas emission control.

The climate change regulation may impact several sectors of the economy. The steps that manufacturers will need to take to comply with the regulatory standards are expected to lead to price increases for new vehicles. Many of the technological options that manufacturers choose to comply with the regulation are also expected to reduce operating costs. These two responses to the regulation have combined positive and negative impacts on California businesses and consumers. Based on the staff analysis, the net

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effect of the regulation on the economy is expected to be small but positive. The number of California jobs will increase by 53,000 in 2020 and 77,000 in 2030, and personal income will increase as well. There is no impact on the ability of California business to compete with businesses in other states. State and local agencies will not be adversely affected and are likely to realize a net reduction in their cost of fleet operations.

Staff estimates that the regulation will reduce climate change emissions from the light duty passenger vehicle fleet by an estimated 87,700 CO₂-equivalent tons per day statewide in 2020 and by 155,200 CO₂-equivalent tons per day in 2030. This equates to an 18 percent reduction in climate changes emissions from the light-duty fleet in 2020 and a 27 percent reduction in 2030. The regulation will also reduce emissions that occur during the fuel cycle (the marketing and distribution of gasoline). Such activities produce both climate change and criteria pollutant (smog-forming) emissions.

Manufacturers have argued that the regulation will significantly increase criteria pollutant emissions, because consumers will postpone the purchase of cleaner new vehicles due to the higher initial cost, and will increase their driving due to the reduced cost of operating the vehicles. Staff evaluated these issues as part of its analysis of the potential effects of the regulation. In both cases staff found that the effect on emissions is small.

AB 1493 states that the Board, in developing the regulation, must:

- Consider the technological feasibility of the regulation,
- Consider the impact the regulation may have on the economy of the state,
- Provide flexibility, to the maximum extent feasible consistent with the bill, in the means by which a person subject to the regulation may comply,
- Conduct public workshops in the state, including, but not limited to, public workshops in three of the communities in the state with the most significant exposure to air contaminants or localized air contaminants, including communities with minority populations or low-income populations, or both,
- Grant emissions reductions credits for reductions in greenhouse gas emissions from motor vehicles that were achieved prior to the operative date of the regulation, and
- Coordinate with the State Energy Resources Conservation and Development Commission, the California Climate Action Registry, and the interagency task force convened pursuant to subdivision (e) of Section 25730 of the Public Resources Code.

All of these elements were carefully addressed during the development of the greenhouse gas reduction regulation.

Staff has not identified any mechanisms by which the climate change regulation would result in a disproportionate negative environmental or economic impact on low income or minority communities. In fact, the reduced emissions from the distribution and marketing of gasoline are likely to provide benefits to these communities. Staff also evaluated the broader impacts of the regulation on job and business creation in representative San

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Diego communities with environmental justice concerns. The evaluation concluded that the regulation would likely result in an increase in jobs and business creation.

The approved regulation complies with the legislative mandate. The staff has been careful throughout the development of the regulation to incorporate every consideration that is required by AB 1493 and to avoid those measures that are prohibited by the statutory language. The regulation is good for public health and the environment, good for the California economy, and good for consumers. It reduces greenhouse gases and smog forming emissions, it increases jobs and personal income statewide, it preserves consumer choice, and it results in a net savings for consumers.

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1 INTRODUCTION

Chapter 200, Statutes of 2002 (AB 1493, Pavley) directs the Air Resources Board (Board) to adopt regulations that achieve the maximum feasible and cost effective reduction of greenhouse gas emissions from motor vehicles. AB 1493 requires the Board to transmit the regulation to the appropriate policy and fiscal committees of the Legislature for review. The bill also directs the Board report to the Legislature and the Governor, and outlines several areas that the Board's report must address:

First, the Board must report on the content of the regulation adopted.

Second, the report must describe the specific actions taken by the Board to:

- Consider the technological feasibility of the regulation,
- Consider the impact the regulation may have on the economy of the state,
- Provide flexibility, to the maximum extent feasible consistent with the bill, in the means by which a person subject to the regulation may comply,
- Conduct public workshops in the state, including, but not limited to, public workshops in three of the communities in the state with the most significant exposure to air contaminants or localized air contaminants, including communities with minority populations or low-income populations, or both,
- Grant emissions reductions credits for any reductions in greenhouse gas emissions from motor vehicles that were achieved prior to the operative date of the regulation, and
- Coordinate with the State Energy Resources Conservation and Development Commission, the California Climate Action Registry, and the interagency task force convened pursuant to subdivision (e) of Section 25730 of the Public Resources Code.

Third, the report must discuss the actions taken by the California Climate Action Registry, which, in consultation with the Board, is directed to adopt procedures for the reporting of reductions in greenhouse gas emissions from mobile sources to the Registry.

Finally, the report must include an analysis of the impact of the regulation on communities in the state with the most significant exposure to air contaminants or toxic air contaminants, including communities with minority populations or low-income populations, and the economic and public health impacts of the Board's actions on the state.

This report is submitted in keeping with the requirements of AB 1493. To underscore the need for state action and provide context for consideration of the Board's approach, section 2 provides background on climate change and its effects on California. Sections 3 through 7 address each of the statutorily required areas referenced above, reordered slightly so as to improve the overall flow of the discussion. Specifically, section 3 summarizes the content of the approved regulation, section 4 summarizes the staff's evaluation of the impact of the regulation on the state economy and on public health, section 5 outlines the actions taken by the Board in developing the regulation, section 6

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describes the actions of the California Climate Action Registry, and section 7 discusses the impact of the regulation on communities. Section 8 presents the conclusion. Finally, Appendix A contains the text of the approved regulation and thereby serves to transmit the regulatory language to the appropriate policy and fiscal committees of the Legislature.

During the development of the climate change regulation the staff of the Air Resources Board conducted a comprehensive and thorough analysis of the technologies available to reduce motor vehicle greenhouse gas emissions, their cost, and the environmental and economic impacts of the standard. That analysis is described in detail in the August 6, 2004 Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles and various supporting documents. This report provides an overview of the relevant staff findings and conclusions. Additional detail is provided in the staff report and its supporting materials.

Please note that the information provided here may be supplemented by additional material as the Board completes the Final Statement of Reasons and other documents that must be filed with the Office of Administrative Law as part of the rulemaking process. These procedures must be completed before the rulemaking is considered complete and before the regulations can be considered adopted and operative. In particular, at its September 2004 hearing the Board directed the Executive Officer to make further modifications to the regulation, to make additional modifications she determines appropriate, and to consider significant environmental issues, if any, raised in the public comment periods before taking final action on the regulation. (See Board Resolution 04-28.)

2 CLIMATE CHANGE AND CALIFORNIA

The temperature on Earth is regulated by a system commonly known as the greenhouse effect. Naturally occurring greenhouse gases, primarily water vapor, CO₂, CH₄, and N₂O, absorb heat radiated from the Earth's surface. As the atmosphere warms, it in turn radiates heat back to the surface. Without the natural heat trapping effect of greenhouse gases the Earth's surface temperature would be about 61°F colder than it is now.

Climate change is a shift in the average weather that a given region experiences. This is measured by changes in the features that we associate with weather, such as temperature, wind patterns, precipitation, and storms. Global climate change means change in the climate of the Earth as a whole. Global climate change can occur naturally; an ice age is an example of naturally occurring climate change. The Earth's natural climate has always been, and still is, constantly changing. The climate change we are seeing today, however, differs from previous climate change in both its rate and its magnitude. Over the 20th century, we have observed a rapid change in the climate that is attributable to human activities. The global mean temperature is warming at a rate that cannot be explained by natural causes alone. Human activities are directly altering the chemical composition of the atmosphere through the buildup of greenhouse gases.

Recent technical assessments, which assume no major interventions to reduce continued growth of world greenhouse emissions, indicate that temperatures in the United States will rise by about 5-9°F on average in the next 100 years, which is more than the projected global average increase. In general the continental regions of the Northern Hemisphere are expected to warm more than the global average. This rise is very likely to be associated with more extreme precipitation and faster evaporation of water, leading to greater frequency of both very wet and very dry conditions.

In California, the past century has already seen changes in climate-related conditions such as average temperature (up 0.7°F), sea level (up 3 to 8 inches), spring run-off (decreased by 12 percent), and the timing of snowmelt and spring bloom (advanced by 1 to 3 weeks).

Projected future climate change may affect California in a variety of ways. Public health can suffer due to greater temperature extremes and more frequent extreme weather events, increases in transmission of infectious disease, and increases in air pollution.

California's agriculture industry is especially vulnerable to altered temperature and rainfall patterns, and new pest problems. Climate change could impact California agriculture by increasing the demand for irrigation to meet higher evaporative demand, increasing the incidence of pests, and through direct temperature effects on production quality and quantity. Dairy products (valued at \$3.8 billion annually) and grapes (\$3.2 billion annually) are the two highest-value agricultural commodities in California's \$30 billion agriculture sector. Climate scientists have recently projected that California will get hotter and drier by the end of the century, threatening its valuable wine and dairy industries. Wine-growing

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regions in California that are currently warm could face challenges in terms of overripe fruit, added water stress, and increases in diseases and pests.

Forest ecosystems would face increased fire hazards and would be more susceptible to pests and diseases. The Sierra snowpack that functions as the state's largest reservoir could shrink by a third by 2060, and to half its historic size by 2090. Runoff that fills reservoirs will start in midwinter, not spring, and rain falling on snow will trigger more flooding. The California coast is likely to face a rise in sea level that could threaten its shorelines. Sea level rise and storm surges could lead to flooding of low-lying property, loss of coastal wetlands, erosion of cliffs and beaches, saltwater contamination of drinking water, and damage to roads, causeways, and bridges.

When most people think about climate change, they imagine gradual increases in temperature and only marginal changes in other climatic conditions, continuing indefinitely or even leveling off at some time in the future. However, recent climate change research has uncovered a disturbing feature of the Earth's climate system: it is capable of sudden, violent shifts. This is a critically important realization. Climate change will not necessarily be gradual, as assumed in most climate change projections, but may instead involve relatively sudden jumps between very different states. A mounting body of evidence suggests that continued greenhouse gas emissions may push the oceans past a critical threshold and into a drastically different future. Thus, in addition to the gradual (albeit accelerated) climate changes projected by current climate models, Californians need to be aware of the possibility of much more sudden climate shifts. These shifts have a scientifically well-founded place among the possible futures facing the State and should be among the possibilities accommodated in planning and adaptation measures.

The State of California has traditionally been a pioneer in efforts to reduce air pollution. California likewise has a long history of actions undertaken in response to the threat posed by climate change. California action specifically to control greenhouse gases is strongly supported by the public. The July 2004 Special Survey on Californians and the Environment, conducted by the Public Policy Institute of California, found that eight in ten Californians support the state law that requires automakers to further reduce the emission of greenhouse gases from new cars in California by 2009.

3 THE APPROVED REGULATION

This section first outlines the guidance provided by the Legislature as to the nature of the regulation to be adopted by the Board. It then summarizes the content of the regulation and staff's estimate of the cost of compliance. The specific regulatory language, as proposed for comment in a 15-day public comment period ending November 5, 2004, is provided in Appendix A below. This may be the final regulatory text, barring any changes needed to conclude the rulemaking process. (See Introduction page 2.)

3.1 Statutory Guidance

Section 43018.5(a) of the Health and Safety Code, added by AB 1493, directs the Board to adopt regulations that achieve the maximum feasible and cost effective reduction of greenhouse gas emissions from motor vehicles. Section 43018.5(i) defines "maximum feasible and cost-effective reduction of greenhouse gas emissions" as greenhouse gas emission reductions that the Board determines meet both of the following criteria:

- Capable of being successfully accomplished within the time provided, taking into account environmental, economic, social, and technological factors, and
- Economical to an owner or operator of a vehicle, taking into account the full life-cycle costs of a vehicle.

The bill also lists a variety of measures and approaches that the Board cannot use. Section 43018.5(d) provides that the regulation adopted by the Board shall not require any of the following:

- The imposition of additional fees and taxes on any motor vehicle, fuel, or vehicle miles traveled, pursuant to this section or any other provision of law,
- A ban on the sale of any vehicle category in the state, specifically including, but not limited to, sport utility vehicles and light-duty trucks,
- A reduction in vehicle weight,
- A limitation on, or reduction of, the speed limit on any street or highway in the state, or
- A limitation on, or reduction of, vehicle miles traveled.

Section 43018.5(c)(3) directs that the regulation provide flexibility, to the maximum extent feasible consistent with this section, in the means by which a person subject to the regulation may comply. That flexibility shall include authorization for a person to use alternative methods of compliance.

Section 43018.5(c)(5) directs that the regulation grant emissions reductions credits for any reductions in greenhouse gas emissions from motor vehicles that were achieved prior to the operative date of the regulation.

Finally, the bill provides that certain work trucks shall be exempted from the regulation. Specifically, section 43018.5(e) states that the regulation adopted by the Board shall

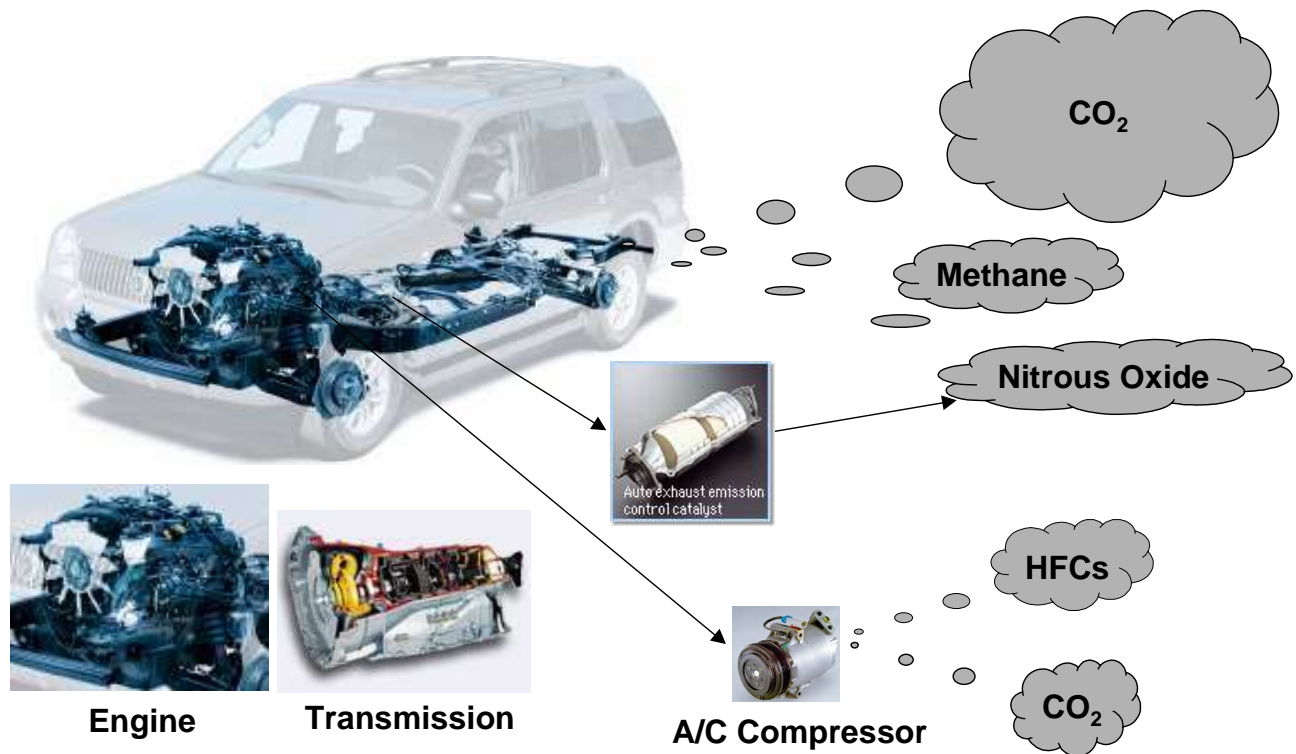
provide an exemption for those vehicles subject to the optional low-emission vehicle standard for oxides of nitrogen (NO_x) for exhaust emission standards described in paragraph (9) of subdivision (a) of Section 1961 of Title 13 of the California Code of Regulations.

3.2 Content of the Regulation

California's transportation sector is the single largest contributor of greenhouse gases in the State. Unless aggressive action is taken, greenhouse gas emissions in California will likely continue to increase due to population, transportation and land use trends. Greenhouse gases emitted by motor vehicles include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and hydrofluorocarbons (HFCs). As shown in Figure 3-1 below, on-vehicle sources of motor vehicle climate change emissions include:

- CO₂, CH₄ and N₂O emissions resulting directly from operation of the vehicle,
- CO₂ emissions resulting from operating the air conditioning system, and
- HFC (refrigerant) emissions from the air conditioning system due to either leakage, losses during recharging, or release from scrappage of the vehicle at end of life.

Figure 3-1: Motor Vehicle Greenhouse Gas Emission Sources



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Motor vehicle related climate change emissions also include upstream emissions associated with the production of the fuel used by the vehicle. The regulation approved by the Board imposes climate change emission standards that address all of these elements.

Determination of the climate change emission standards involved several steps. First, the maximum feasible emission reductions were modeled for five vehicle types (small and large car, small and large truck/SUV, minivan) with various technology packages (e.g., engine, drivetrain, and air-conditioning systems). These technology packages were then categorized with respect to their technology readiness (near-, mid-, or long-term). Next, manufacturer-specific data was collected for the California fleet in order to evaluate individual manufacturer product mix. The emission standards for each category were then set based on the manufacturer with the highest average weight vehicles. This ensured that all manufacturers can comply with the standards purely through the application of technology, without resorting to weight reduction or changes in their sales mix.

In setting the standards the staff performed a detailed evaluation of the technologies and fuels available to reduce greenhouse gas emissions, the reductions that could be achieved, and their cost. The evaluation of vehicle technology that formed the basis of the staff assessment was derived primarily from a comprehensive vehicle simulation modeling effort and a thorough cost analysis performed for the Northeast States Center for a Clean Air Future (NESCCAF). The consultants who performed the study have an established track record assessing technology and costs for the automobile industry. ARB staff believes the NESCCAF study is the most advanced and accurate evaluation of vehicle greenhouse gas emission reduction technologies that has been conducted to date. Section 5.1 below, which outlines the actions taken by the Board to ensure that the regulation is technically feasible, describes in more detail the conduct of the NESCCAF study and the open public process used by staff in developing the regulatory standards.

The staff technology assessment reviewed baseline vehicle attributes and their contribution to atmospheric climate change emissions, and evaluated technologies that have the potential to decrease these emissions. The technologies explored are currently used on some vehicle models, or have been demonstrated by auto companies and/or vehicle component suppliers in at least prototype form. Promising near-term technologies that emerged from the staff evaluation include:

- Cylinder deactivation: Allows the engine to operate on fewer cylinders when load is reduced during light acceleration and steady cruise operation. Currently used on the Chrysler 300C Hemi, the Honda Accord hybrid, and the Honda Odyssey.
- Improved transmissions: Automated manual transmissions and six-speed automatics reduce energy losses by eliminating the torque converter in conventional automatic transmissions and/or by incorporating more gear ranges that allow the engine to operate more often in an optimum speed and load range. Currently used on some models produced by BMW, Jaguar, Ford, Mercedes-Benz, Volkswagen, Land Rover, Lexus, Mazda, Aston Martin, Ferrari, Maserati, Gallardo, Rolls Royce, and Bentley.

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- Variable valve timing and lift. Variable valve timing and lift can improve engine carbon dioxide emissions by more optimally managing precisely when the valves open and close and exactly how much they open and close. Currently used on Toyota Corolla, Matrix and Celica; Honda Accord, Civic, Civic Hybrid, CR-V, Element, Insight, Odyssey, Pilot, and S2000; Acura RL, TL, TSX, RSX, and NSX; BMW 3, 5, 6 and 7-series; Subaru Outback; and Porsche 911.
- Turbocharging. The use of a compressor to increase the charge entering the cylinders improves engine power output and offers the opportunity to downsize the engine without compromising vehicle performance, thereby allowing operation of the engine in more optimal low-CO₂ regions. Currently used on some models produced by Audi, Mitsubishi, Volkswagen, General Motors, Chrysler, and Mercedes-Benz.
- Gasoline direct injection – stoichiometric. Carbon dioxide reductions can be achieved through modifications of the fuel injection system of gasoline vehicles to directly inject the fuel into the cylinder (conventional engines inject fuel into the intake manifold ahead of the intake valve, wherein fuel evaporates and is inducted into the cylinder with the incoming air). Currently used on some models produced by BMW, Audi and Rolls Royce.
- More efficient, low-leak air conditioning: CO₂ emission reductions of 30 to 50 percent of the fraction attributable to air conditioning use may be achievable by reducing the engine load requirements of air conditioning systems. In addition, industry sources estimate that existing systems can be cost-effectively improved to achieve up to 50 percent reduction in refrigerant leakage. Currently under development.

For the mid-term, manufacturers will be able to take advantage of a broader range of technologies. Greenhouse gas reduction technologies that staff anticipates will be widely available in the mid-term (2013 through 2016) include the integrated starter/generator, camless valve actuation, gasoline homogeneous combustion compression ignition engines, and more efficient, low-leak air conditioning systems using an alternative refrigerant with a low global warming potential such as R-152a.

The greenhouse gas emission standards are incorporated into the current Low-Emission Vehicle (LEV) program, along with the other light and medium-duty automotive emission standards. Because different pollutants vary in the severity of their climate change impact, the standards are expressed in terms of “CO₂-equivalent” emissions. Accordingly, there is one CO₂-equivalent fleet average emission requirement for the passenger car/light-duty truck 1 (PC/LDT1) category, and another for the light-duty truck 2 (LDT2) category, just as the LEV program currently has fleet average NMOG emission requirements for both categories of vehicles.

The standards approved by the Board phase in during the 2009 through 2016 model years, allowing changes to be made as part of the normal product improvement cycle. When fully phased in, the near term (2009-2012) standards will result in about a 22 percent greenhouse gas reduction as compared to the 2002 fleet, and the mid-term (2013-2016) standards will result in about a 30 percent reduction. The specific standards, by vehicle type and model year, are presented in Table 3-1 below.

Table 3-1: CO₂-Equivalent Emission Standards

Tier	Year	CO ₂ -equivalent emission standard (g/mi)	
		PC/LDT1 (Passenger cars and small trucks/SUVs)	LDT2 (Large trucks/SUVs)
Near-term	2009	323	439
	2010	301	420
	2011	267	390
	2012	233	361
Mid-term	2013	227	355
	2014	222	350
	2015	213	341
	2016	205	332

The regulation takes into account and fully credits any differences in greenhouse gas emissions due to the use of alternative fuels. To maintain simplicity, the regulation uses the upstream emissions for vehicles that use conventional fuels as a “baseline” against which to compare the relative merits of alternative fuel vehicles. Therefore, the emissions standards as shown above do not directly reflect upstream emissions. Rather, when certifying gasoline or diesel-fuel vehicles manufacturers report only the “on vehicle” emissions. For alternative fuel vehicles, exhaust CO₂ emissions values are adjusted in order to compensate for the differences in upstream emissions. This approach simplifies the regulatory treatment of gasoline vehicles, while at the same time recognizing any emission changes due to the use of alternative fuels.

The regulation allows manufacturers significant flexibility in complying with the proposed emission standards. Specifically, the regulation would allow manufacturers to average emissions across their vehicle models, aggregate the different climate change pollutants, bank excess credits for later use, and trade credits in order to meet the greenhouse gas emission standards. The regulation also includes an alternative compliance mechanism, applicable to vehicles that are regulated through AB 1493 and their fuels. This is to ensure that the program does not dilute the technology-forcing nature of the regulation, since the goal is to reduce emissions from the vehicles themselves. The regulation also provides credit for emission reductions achieved prior to the operative date of the regulation, available for model years 2000 through 2008. Manufacturers are allowed to opt in to the program during any model year during this timeframe. The baseline against which manufacturer emissions are measured is the fully phased in near term standard. The flexibility, alternative compliance and early credit provisions of the regulation are discussed in more detail in sections 5.3 and 5.5 below.

Small Volume, Independent Low Volume, and Intermediate Volume manufacturers are not required to comply with the climate change requirements until the final year of the phase-in (2016). Beginning in 2016, these smaller manufacturers would be required to meet the

average CO₂ equivalent emissions of all 2012 comparable vehicles produced by the major vehicle manufacturers. A specialty low volume vehicle that uses a powertrain from a major manufacturer from the same model year would be considered compliant with the greenhouse gas emission standards if it adopted the package without modifications. Should a comparable vehicle not be available from a large manufacturer, the small volume manufacturer is required to meet, in 2016 and beyond, the 2012 emission standard for large volume manufacturers.

3.3 Estimated Cost of Control

As part of its technology evaluation, staff estimated the average fleetwide incremental cost of control to meet the greenhouse gas emission standards. The cost estimates take into account the phase-in of the standard and the specific starting point of the six largest individual manufacturers. The estimated average costs are shown in Table 3-2 below.

Table 3-2: Average Cost of Control

Tier	Year	Average cost of control	
		PC/LDT1 (Passenger cars and small trucks/SUVs)	LDT2 (Large trucks/SUVs)
Near-term	2009	\$17	\$36
	2010	\$58	\$85
	2011	\$230	\$176
	2012	\$367	\$277
Mid-term	2013	\$504	\$434
	2014	\$609	\$581
	2015	\$836	\$804
	2016	\$1,064	\$1,029

Thus when fully phased in the near-term standards will result in an estimated average cost increase of \$367 for PC/LDT1, and \$277 for LDT2 as compared to the 2009 baseline vehicle. The fully phased in mid-term standards will result in an estimated average cost increase of \$1,064 for PC/LDT1 and \$1,029 for LDT2.

Staff then examined the lifetime cost of these technologies to vehicle owner-operators. The staff analysis concluded that due to the higher efficiency of the regulated vehicles, the increased up front costs will be more than offset by operating cost savings over the lifetime of the vehicle. For example, staff evaluated the potential increase in monthly loan payments over a typical 5-year loan versus the monthly decrease in operating cost. Using the average increase in vehicle prices associated with the fully phased-in regulation (2016), and an assumed fuel price of \$1.74 per gallon, staff calculated that the increased vehicle payment minus the reduction in operating cost would result in a monthly savings of about \$3.50 to \$7.00. At higher fuel prices, the monthly savings increase and the payback period decreases.

In testimony before the Board and in comments submitted as part of the rulemaking process, automakers have criticized the staff technology analysis and cost estimates. The primary issues raised include the effect of the proposal on vehicle cost, vehicle availability, and vehicle attributes.

With regard to cost, the manufacturers argue that staff has underestimated the cost of the needed technology and overestimated the lifetime savings to the consumer. Specifically, they argue that the cost of meeting the fully phased in standard (2016) will be \$3,000 per vehicle rather than the \$1,000 estimated by staff, and that the lifetime operating cost savings will be \$1,000 rather than the \$3,000 estimated by staff. They then conclude that the standards are not “economical to the consumer” as required by AB 1493.

Staff has reviewed the various issues raised by commenters and has not identified any concerns that lead to a change in the staff conclusions. Staff relied on a state of the art evaluation of technologies for greenhouse gas emission control. In addition, the rulemaking record includes evidence demonstrating a clear historical pattern of automakers exaggerating the projected cost of compliance. Based on a review of analyses of previous vehicle emission control requirements, the commenters found that the auto industry and its allies have historically overestimated the projected costs of proposed regulations by a factor of about 2 to 10 times the actual cost. A point by point response to the specific issues raised by the automakers will be provided in the Final Statement of Reasons.

Manufacturers argue that the regulation will restrict vehicle availability because they will be unable to sell large trucks and SUVs in California and still meet the fleet average standard. As is noted in section 3.2 above, the standard was set such that it can be met by all manufacturers while maintaining full availability of today’s models. The standard requires improved technology, but does not require manufacturers to build different types of vehicles. Moreover, the regulation provides a specific exemption from the standard for a portion of the manufacturer’s fleet to account for work trucks.

Finally, manufacturers state that the regulation will adversely affect vehicle attributes such as acceleration, weight, and towing capacity. The vehicle modeling that forms the heart of the technology evaluation, however, assumed that while meeting the standards vehicles also maintain the projected model year 2009 baseline performance levels, which are somewhat beyond today’s levels. Thus the vehicles will perform better than the vehicles in showrooms today, while at the same time substantially reducing their greenhouse gas emission levels. With respect to weight, no downsizing is needed in order to meet the standards. Rather, they can be met entirely through the application of technology.

In considering such issues regarding the effect of the standard, it is important to bear in mind that the proposal provides ample lead time (no changes are needed until model year 2009) and ample phase in time (the standards are then phased in over an eight year period). Thus manufacturers can build the needed modifications into their production

plans. They will not be required to tear up existing facilities or plans; rather they can incorporate the needed technology into future planned redesigns.

3.4 Summary

The approved regulation fully complies with the legislative guidance provided in AB 1493. The standards are technically feasible. In adopting the regulation the Board also considered environmental, economic and social factors. The standards are economical to the consumer over the life of the vehicle, resulting in a monthly net savings. The regulation does not employ any of the measures prohibited by the Legislature-it does not impose fees or taxes on any motor vehicle, fuel, or vehicle miles traveled; it does not ban the sale of any vehicle category; it does not require a reduction in vehicle weight; and it does not limit or reduce the speed limit or vehicle miles traveled. The regulation provides maximum flexibility, includes an alternative compliance mechanism, and also allows credit for early action. Finally, the regulation provides the required exemption for certain work trucks.

4 ECONOMIC AND PUBLIC HEALTH IMPACTS OF THE REGULATION

AB 1493 directs the Board to consider and report on the economic and public health impacts of the regulation on the state.

4.1 Economic Impacts

Staff performed a thorough assessment of the impact of the regulation on the state economy. The major tool used for the analysis of the economic impact of the regulation is a model of the California economy developed by the University of California, Berkeley. The model used for this analysis is a modified version of the Dynamic Revenue Analysis Model (DRAM) which has been used by the California Department of Finance for several tax policy evaluations. The modified model accounts for additional environmental sectors and is known as the Environmental Dynamic Revenue Analysis Model (E-DRAM). E-DRAM describes the relationships among California producers, California consumers, government, and the rest of the world. The model consists of over 1,000 equations designed to capture the interactions among over 100 industrial sectors, 2 factors of production sectors (labor and capital), 9 consumer good sectors, 7 household sectors (classified by income level), 1 investment sector, 45 government sectors (8 federal, 21 State, and 8 local), and the rest of the world. The model has been used to assess the economic impacts of California's air quality State Implementation Plans, reformulated gasoline regulations, the petroleum dependency study required by AB 2076, and other regulations.

When using E-DRAM, the impacts of regulations are estimated by changing the inputs to the model to represent the effects of the regulation on the relevant industry or consumer sectors. Such changes to the model enable it to assess the economic impacts of large-scale environmental regulations. The economic impact results are expressed in terms of changes in the State output of goods and services, personal income, and employment. The estimates of the regulation's impact on these economic factors then are used to assess the potential impacts on business creation, elimination, or expansion in California.

The climate change regulation may impact several sectors of the economy. The steps that manufacturers will need to take to comply with the regulatory standards are expected to lead to price increases for new vehicles. Many of the technological options that manufacturers choose to comply with the regulation are also expected to reduce operating costs. These two responses to the regulation have combined positive and negative impacts on California businesses and consumers. Increased vehicle prices, for example, may result in a reduction of demand for other goods and services as consumers use more of their money to pay for the price increase. California firms may respond by cutting back production and decreasing employment. On the other hand, in response to the regulation automobile manufacturers are expected to choose technologies that reduce vehicle operating costs, leaving consumers with additional money to spend on products and services. This would, in turn, induce firms supplying those products and services to expand their production and increase their hiring of workers. A third type of effect occurs

when purchase of the new vehicles directly lowers demand for the petroleum refining and gasoline distribution sectors. The net effect on the California economy of these activities hinges on the extent to which products and services are obtained locally. Using the E-DRAM model of the California economy, staff estimated the net effects of these activities on affected industries and the overall economy. The California industries and individuals affected most by the climate change regulation are those engaged in the production, distribution, sales, service, and use of light-duty passenger vehicles as well as the refining and distribution of gasoline.

Based on the staff analysis, the net effect of the regulation on the economy is expected to be small but positive. Table 4-1 below shows the changes in state output, personal income and jobs for 2010, 2020 and 2030, as estimated by the E-DRAM simulation.

Table 4-1: Estimated Changes in State Output and Personal Income (Dollars in Billions)

	2010		2020		2030	
	Difference	Percent Change	Difference	Percent Change	Difference	Percent Change
Output	-\$0.04	-0.002	-\$2.84	-0.09	-\$5.49	-0.1
Personal Income	\$0.17	0.01	\$4.76	0.2	\$7.32	0.3
Jobs	3,000	0.02	53,000	0.3	77,000	0.4

As is shown in the table, state output is expected to decrease very slightly, while personal income and jobs would increase to a somewhat greater extent. Overall, the estimated impacts on the California economy are quite small. There is no impact on the ability of California business to compete with businesses in other states. State and local agencies will not be adversely affected and are likely to realize a net reduction in their cost of fleet operations.

4.2 Public Health Impacts

During the rulemaking process, some commenters questioned the value of California action, stating that measures adopted in California will have no discernable effect on global climate change and thus no effect on the potential public health and environmental consequences of climate change in California. Although greenhouse gas emissions from California light duty vehicles are a small fraction of the global total, it does not necessarily follow that California should do nothing. Rather, there are several compelling reasons to move forward with state regulation, even while recognizing that by itself it will not solve the climate change problem. First of all, the approved regulation is a “no regrets” policy that reduces climate change emissions but at the same time provides economic benefit to the state. Second, California is not acting in isolation. Other states in the United States, and other countries internationally, have already taken or are contemplating steps to reduce greenhouse gas emissions from a variety of sectors and sources. Finally, the

longstanding technology-forcing role of California regulation should not be understated. There have been many instances where other jurisdictions have adopted motor vehicle controls that were pioneered in California. Thus there is potential for the new regulation to spread to other jurisdictions and add momentum to the already existing measures that are underway around the globe. The approved regulation represents California's contribution to the solution to this global problem, and as part of ongoing, broader efforts will help to protect the public health of California's citizens.

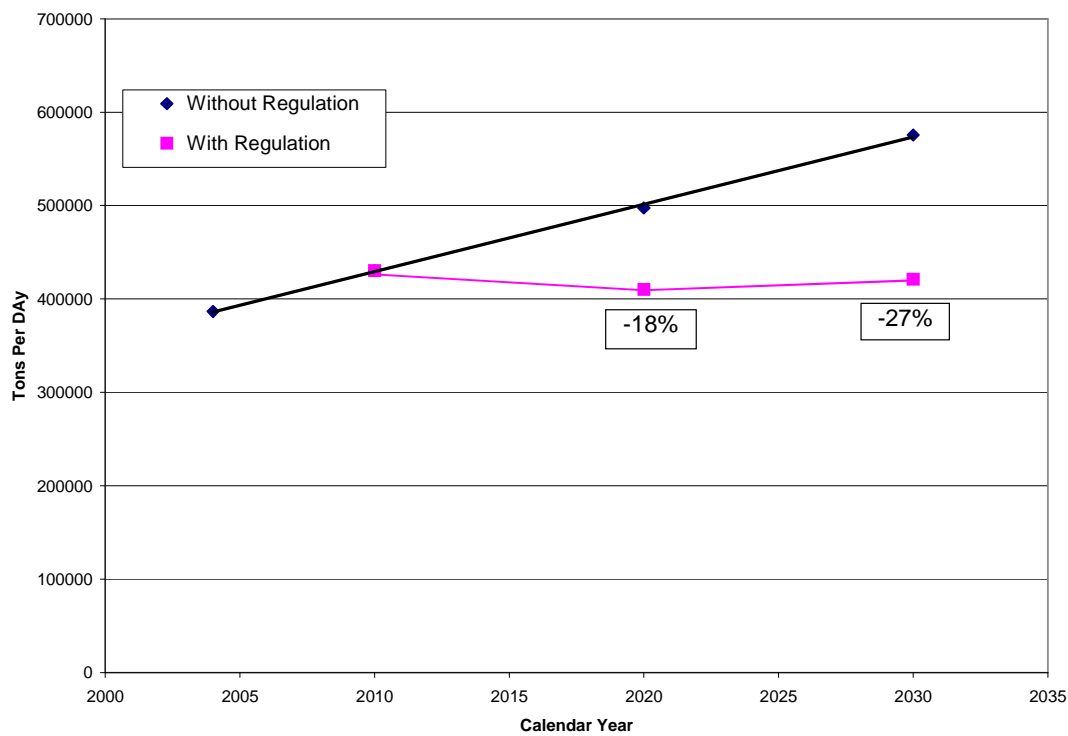
As part of the development of the greenhouse gas standards staff estimated the percent reduction in CO₂-equivalent emissions rates by model year for those vehicles subject to the regulation. In order to calculate the effect of the regulation on fleetwide emissions, staff then compared these percent reductions to the baseline CO₂-equivalent emissions by model year from the EMFAC2002 mobile source emissions model for calendar years 2020 and 2030. Table 4-2 presents the baseline inventory, the adjusted inventory with the regulation in place, and the estimated benefits of the regulation.

Table 4-2: Light Duty Fleet CO₂-Equivalent Emissions and Reductions (tons per day)

	Baseline Inventory		Adjusted Inventory With Regulation		Emission Reduction	
	2020	2030	2020	2030	2020	2030
PC/LDT1	350,500	400,000	283,400	282,800	67,100	117,200
LDT2	146,900	175,500	126,200	137,400	20,700	38,000
Total Light Duty	497,400	575,500	409,600	420,300	87,700	155,200

As shown above, staff estimates that the regulation will reduce climate change emissions from the light duty passenger vehicle fleet by an estimated 87,700 CO₂-equivalent tons per day statewide in 2020 and by 155,200 CO₂-equivalent tons per day in 2030. This equates to an 18 percent reduction in climate change emissions from the light-duty fleet in 2020 and a 27 percent reduction in 2030. Baseline emissions today (2004) are 386,600 CO₂-equivalent tons per day, and in 2010 will be 430,200 CO₂ equivalent tons per day. Thus with the regulation emissions will continue to grow from today's level through 2009 when the regulation takes effect, but emissions in 2020 and in 2030 will be lower than in 2010. Figure 4-1 shows this information in graphic form.

Figure 4-1. Motor Vehicle GHG Emissions (Excluding Upstream Emissions)



The above estimates describe emission reductions from the vehicles themselves. The regulation will also reduce emissions that occur during the fuel cycle (the marketing and distribution of gasoline). Such activities produce both climate change and criteria pollutant (smog-forming) emissions.

Staff quantified the marginal fuel cycle greenhouse gas emissions from conventional vehicles. Marginal fuel cycle emissions, which are the changes in emissions that result from changes to current levels of refueling activity, were used because they best represent the real world effect of the regulation. The results show that the fuel cycle greenhouse gas emissions for gasoline vehicles are 31 percent of the vehicle emissions on a CO₂-equivalent basis. Thus, for each ton of greenhouse gas emissions reduced from vehicles, an additional 0.31 tons will be eliminated from the fuel cycle. Staff estimates that these additional fuel cycle reductions will reduce greenhouse gas emissions by 27,000 tons per day in 2020 and 47,900 tons per day in 2030.

The regulation will also provide fuel cycle benefits for criteria pollutants. ARB staff quantified the emission reduction in criteria pollutants for 2020 and 2030. The analysis calculates the reductions in criteria pollutant emissions using marginal fuel cycle emission factors based on an average vehicle. Staff estimates that the regulation will reduce “upstream” smog-forming emissions of hydrocarbons and oxides of nitrogen by approximately 6 tons per day in 2020 and 10 tons per day in 2030.

Manufacturers have argued that the regulation will actually significantly increase criteria pollutant emissions. This argument relies on the assumption that consumers will postpone the purchase of cleaner new vehicles due to the higher initial cost, and will increase their driving due to the reduced cost of operating the vehicles. As part of its comprehensive analysis of the potential effects of the regulation, staff retained experts at the University of California to evaluate each of these issues. In both cases the new studies found that the effect on emissions is small.

Recent disruptions in fuel supplies have at times greatly increased California fuel prices. Technologies and strategies required by the regulation to reduce climate change emissions are also expected to reduce future demand for gasoline as compared to current trends. Reduced demand will mitigate the potential impacts from shortages of cleaner-burning gasoline. To the extent that alternative-fueled vehicles are used, this will also help reduce gasoline demand.

At times, the refining, marketing and distribution of gasoline adversely affects water quality due to leaks, spills, and wastewater discharge. Any reduction in fuel use will reduce the opportunity for such occurrences. Consequently, the ARB staff projects that the regulation will have a positive impact on water quality.

5 ACTIONS TAKEN BY THE BOARD

This section outlines the specific actions taken by the Board to comply with the requirements of AB 1493. The bill states that the Board, in developing the regulation, must:

- Consider the technological feasibility of the regulation,
- Consider the impact the regulation may have on the economy of the state,
- Provide flexibility, to the maximum extent feasible consistent with the bill, in the means by which a person subject to the regulation may comply,
- Conduct public workshops in the state, including, but not limited to, public workshops in three of the communities in the state with the most significant exposure to air contaminants or localized air contaminants, including communities with minority populations or low-income populations, or both,
- Grant emissions reductions credits for any reductions in greenhouse gas emissions from motor vehicles that were achieved prior to the operative date of the regulation, and
- Coordinate with the State Energy Resources Conservation and Development Commission, the California Climate Action Registry, and the interagency task force convened pursuant to subdivision (e) of Section 25730 of the Public Resources Code.

All of these elements were carefully addressed during the development of the greenhouse gas reduction regulation. The following sections describe in turn the actions taken by the Board in each area.

5.1 Consider Technological Feasibility

First of all, the Board was directed to consider the technological feasibility of the regulation. As noted in section 3.3 above, the vehicle technology results that formed the basis of the staff assessment were derived primarily from a comprehensive vehicle simulation modeling effort and a thorough cost analysis performed for the Northeast States Center for a Clean Air Future (NESCCAF). That section described the substantive findings of the staff analysis. This section discusses the actions taken by the Board to ensure that the standards are technically feasible.

The participants in the NESCCAF study included AVL Powertrain Engineering, Inc. (AVL), Martec, and Meszler Engineering Services. ARB staff monitored the progress of this independent study and was afforded various opportunities to provide comments on the analysis. ARB staff also monitored a separate TIAX, LLC analysis of the greenhouse gas benefits of alternative fuel vehicles, including upstream benefits, and the cost associated with alternative fuel vehicle technologies. ARB staff also met with representatives from EPA, the Society of Automotive Engineers, the Mobile Air Conditioning Society, and the National Renewable Energy Laboratory to develop its approach for reducing the effects of air conditioning refrigerant emissions and excess CO₂ emissions from air conditioning use on climate change.

Throughout the development of the regulation, ARB provided numerous opportunities for public review and comment. ARB hosted several meetings to provide an update on the process of formulating climate change emission standards and to solicit feedback and public comment from relevant stakeholders, interested parties, and technology developers. ARB hosted an International Technology Symposium in March of 2003 in an effort to bring together international experts on climate change emission reduction technologies. Leading researchers from the auto industry, vehicle component suppliers, academia, and vehicle simulation firms were invited to speak, covering numerous technologies and their potential to reduce climate change emissions of vehicles in the 2009-2015 timeframe. Additional feedback on developing a climate change regulation came from an update to the Board on November 20, 2003, at which ARB staff presented its early findings on the individual technologies that are likely to be available in the 2009 timeframe and the potential for climate change emission reductions from these technologies.

Building on the work presented at the earlier public meetings, on April 1, 2004 staff released the Draft Technology and Cost Assessment for Proposed Regulations to Reduce Vehicle Climate Change Emissions Pursuant to Assembly Bill 1493. That report provided a comprehensive assessment of the technologies considered by the ARB staff in formulating targets for the “maximum feasible and cost-effective reduction of greenhouse gases.” ARB then hosted a public workshop on April 20, 2004 to receive public comment on the draft technology assessment. Staff subsequently made available on June 14, 2004 a draft of the Staff Proposal Regarding the Maximum Feasible and Cost-Effective Reduction of Greenhouse Gas Emissions From Motor Vehicles, containing the methodology for developing the standards and the preliminary standards themselves. A workshop was conducted on July 7, 2004 at which staff received valuable comments that were carefully considered in developing the final staff proposal.

Although looking forward to 2016 and projecting what will be feasible in that timeframe may appear daunting to the automotive industry, staff believes that the level of engineering analysis and rigor reflected in the staff analysis to demonstrate feasibility and cost-effectiveness is comparable to previous efforts in the Low Emission Vehicle (LEV) program. The LEV standards, which result in lower smog-forming emissions, have been successfully implemented with full model availability and only a small increase in vehicle price. Likewise, staff expects that the required climate change emission reductions can be achieved effectively, on schedule and economically.

5.2 Consider Impact on the Economy of the State

The Board also was directed to consider the impact the regulation may have on the economy of the state, including, but not limited to, the following areas:

- The creation of jobs within the state,
- The creation of new businesses or the elimination of existing businesses within the state,

- The expansion of businesses currently doing business within the state,
- The ability of businesses in the state to compete with businesses in other states,
- The ability of the state to maintain and attract businesses in communities with the most significant exposure to air contaminants, localized air contaminants, or both, including, but not limited to, communities with minority populations or low-income populations, or both, and
- The automobile workers and affiliated businesses in the state.

Staff performed a thorough assessment of the impact of the regulation on the state economy. Section 4 above provided information on the overall impact. The sections that follow address in turn each of the specific topics highlighted in the statute.

5.2.A Creation of Jobs Within the State

It is likely that savings from reduced vehicle operating costs would end up mostly as expenditures for other goods and services. These expenditures would flow through the economy, causing expansion or creation of new businesses in several sectors. As discussed in section 4.1 above, staff's economic analysis shows that as the expenditures occur, jobs increase. Jobs increase by 3,000 in 2010, by 53,000 in 2020, and 77,000 in 2030 compared to the baseline economy that excludes the regulation.

5.2.B Creation of New Businesses or Elimination of Existing Businesses within the State

The climate change regulation will affect businesses within California in two ways. Businesses will be affected to the extent that they purchase, use or service vehicles subject to the regulation. The climate change regulation affects only light duty vehicles whose primary use is noncommercial personal transportation. Therefore, many vehicles that businesses use would not be covered under the regulation. Businesses that purchase passenger vehicles subject to the regulation would be expected to pay higher prices for the vehicles but save on operating costs. Staff has demonstrated that the reduced operating costs will more than outweigh the effect of the increase in price over the life cycle of the vehicle. Staff also expects the impact on businesses affiliated with the automotive industry to be minor. Service stations will experience a decline in demand for their products relative to the no regulation scenario, but this effect will be mitigated by growth in travel demand.

Businesses will be indirectly affected due to the impact of the regulation on the larger economy. As was noted in section 4.1 above, state output is expected to decrease very slightly, while personal income and jobs would increase to a somewhat greater extent. Overall, the estimated impacts on the California economy and by extension on California businesses are quite small.

5.2.C Expansion of Businesses Currently Doing Business Within the State

As noted above, the E-DRAM analysis projects a slight decrease in state output and a slight increase in state personal income. Again, the effects of the regulation on businesses currently doing business within the state are quite small.

5.2.D Ability of Businesses in the State to Compete with Businesses in Other States

The California businesses potentially impacted by this regulation tend to be affiliated businesses such as gasoline service stations, automobile dealers, and automobile repair shops. These affiliated businesses are mostly local businesses that compete with other local businesses within the state and generally are not subject to competition from out-of-state businesses. Therefore, the regulation is not expected to impose a significant competitive disadvantage on California businesses.

5.2.E Ability of the State to Maintain and Attract Businesses in Communities

The staff analysis used communities in the San Diego area as a surrogate to characterize the potential impacts of the regulation on affiliated businesses in communities statewide. Specifically, communities designated by the San Diego County Air Pollution Control District for environmental justice programs were selected as a surrogate to represent the impacts of the climate change regulation on communities with minority population, or low-income population, or both across the State. The potential economic impacts were assessed on businesses that are linked to automobiles, such as automobile dealers, gasoline stations, and automobile repair.

The reduction in operating cost due to the regulation is expected to save consumers, including consumers in low income and minority communities, a significant amount of money. The analysis showed that the regulation may result in a reduction in employment growth in some businesses affiliated with the automobile industry, such as gasoline service stations. However, the potential reductions are likely to be more than offset by the creation of jobs elsewhere in unaffiliated (non-automotive) businesses, where consumers will spend most of their savings from the reduced operating costs of the new vehicles.

5.2.F Automobile Workers and Affiliated Businesses

Automobile manufacturing in California represents only a very small fraction of the State's economy, about 0.27 percent. Although the regulation will have an impact on national and international automobile manufacturers, the impact in California on auto manufacturing and automobile workers will be small.

Affiliated businesses are those businesses likely to be affected by the regulation due to their relationship with automobile sales, service and operation. Although the staff analysis indicates that there may be a small decrease in sales in the mid term as the cost of the

required technology is passed on to purchasers, no change is expected in the profitability of automotive dealers. That is because the loss in profit associated with a small loss of sales volume is estimated to be roughly equivalent to the increase in profits associated with the small price increase.

As part of its evaluation of community impacts, staff estimated the impact of the regulation on affiliated businesses in the San Diego area. San Diego County is home to approximately 3 million Californians or about 8.3 percent of California's population in 2003. The income distribution in the county roughly mirrors the income distribution for the entire State. To provide a "maximum impact" estimate, the staff analysis assumed that the entire fleet is made up of regulated vehicles. Impacts in the initial years, as regulated vehicles enter into the fleet, would be less. Staff estimates that the impact on profitability would be the most severe on gasoline service stations. This finding reflects a reduction in the growth of profitability rather than an actual decline. The profitability impact on other affiliated businesses would be negligible. No change is expected on the profitability of automotive dealers.

5.3 Provide Flexibility

The Board was directed to provide flexibility, to the maximum extent feasible consistent with the overall requirements of the bill, in the means by which a person subject to the regulation may comply. That flexibility shall include, but is not limited to, authorization for a person to use alternative methods of compliance with the regulation. The Board must ensure that any alternative methods for compliance achieve the equivalent, or greater, reduction in emissions of greenhouse gases as the emission standards contained in the regulation. In providing compliance flexibility, the Board may not impose any mandatory trip reduction measure or land use restriction.

As required by the legislation, the regulation allows manufacturers significant flexibility in complying with the proposed emission standards. Specifically, the regulation allows manufacturers to average emissions across their vehicle models, aggregate the different climate change pollutants, bank excess credits for later use, and trade credits in order to meet the climate change emission standards.

With regard to alternative compliance, the statutory language clearly states that the use of alternative compliance strategies must not undercut the primary purpose of the regulation, which is to achieve greenhouse gas reductions from motor vehicles. Accordingly, the alternative compliance program applies to vehicles that are regulated through AB 1493, and their fuels. This ensures that the program does not dilute the technology-forcing nature of the regulation, since the goal is to improve the vehicles themselves. The major features of the alternative compliance mechanism are:

- Projects must be located in California to be eligible,
- Companies regulated by AB 1493 (automakers) are eligible to apply,

- Vehicles regulated under AB 1493 (model year 2009 and later passenger vehicles, light-duty trucks and other vehicles used for noncommercial personal transportation in California) are eligible for alternative compliance credits, and
- Eligible projects are limited to those that achieve GHG reductions through documented increased use of alternative fuels in eligible vehicles.

5.4 Conduct Public Workshops

AB 1493 directed the Board to conduct public workshops in the state, including, but not limited to, public workshops in three of the communities in the state with the most significant exposure to air contaminants or localized air contaminants, or both, including, but not limited to, communities with minority populations or low-income populations, or both.

As ARB developed the climate change regulation, staff benefited from the support of community leaders working for environmental justice. A core group of leaders in communities with environmental justice concerns was willing to work with staff to ensure the development of an effective and defensible regulation. This core group of environmental justice representatives included environmental, health-based and environmental justice organizations. It was important to ensure that issues specifically impacting communities with environmental justice concerns were identified and addressed. Members of this core group regularly attended ARB workshops and Board hearings in order to have accurate information about our climate change activities. For those unable to attend the scheduled workshops and hearings, staff sent targeted emails with information prior to each workshop followed by a summary of the meeting specifically addressing issues that may be of concern to these communities.

Staff not only attended local community meetings, but also conducted workshops in communities with environmental justice concerns. The dates of the workshops are shown in Table 5-1 below.

Table 5-1: Environmental Justice Workshops

Date	Location
February 18, 2004	Huntington Park
July 6, 2004	Oakland
July 8, 2004	Fresno
July 13, 2004	Pacoima

The first workshop, held in Huntington Park in February 2004, allowed staff to receive input from community members prior to the development of a draft proposal. Working with a core group of stakeholders, a panel was put together for this workshop to provide attendees with an overview of climate change and how it may impact their community. The three workshops in July opened with a representative from the local community providing introductory remarks, and then focused on the ARB's draft staff proposal.

Having local community members and leader participate in the workshops was greatly appreciated and added value and a local context to ARB's presence in these communities.

5.5 Grant Credits For Reductions Achieved Prior To Operative Date

AB 1493 directs that the Board must grant emissions reductions credits for any reductions in greenhouse gas emissions from motor vehicles that were achieved prior to the operative date of the regulation, to the extent permitted by state and federal law governing emissions reductions credits, by utilizing the procedures and protocols adopted by the California Climate Action Registry pursuant to subdivision (j) of Section 42823. The Board is to use the 2000 model year as the baseline for calculating emission reduction credits.

Under the approved regulation, credit for early emission reductions is available for model years 2000 through 2008, with manufacturers allowed to opt in to the program during any model year during this timeframe. The baseline against which manufacturer emissions are measured is the fully phased in near term standard. As noted above, the fully phased in near term standard for passenger cars and LDT1 trucks is 233 grams per mile CO₂ equivalent, and for LDT2 trucks is 361 grams per mile. Thus under the early credit provision of the regulation a manufacturer's fleet average emissions, for model years beginning with their first year of participation through 2008, would be compared to these standards. If a manufacturer has fleet average emissions in a specific model year lower than these standards, the manufacturer would earn early compliance credits. Any emission reduction early credits earned could be used during model years 2009 through 2014, or traded to another manufacturer. To ensure that the regulation ultimately achieves the greatest possible climate change reductions, the credits generated by early compliance retain full value through the 2012 model year but then are worth 50 percent of their initial value in MY 2013, 25 percent of their initial value in MY 2014, and have no value thereafter.

5.6 Coordinate with Other Organizations

The Board must coordinate with the State Energy Resources Conservation and Development Commission, the California Climate Action Registry, and the interagency task force convened pursuant to subdivision (e) of Section 25730 of the Public Resources Code.

The Air Resources Board staff maintains close and ongoing contact with Energy Commission staff on a variety of climate change issues. Staff also attended monthly coordination meetings with the Energy Commission and the California Climate Action Registry. Air Resources Board staff attend all meetings of the Joint Agency Climate Team (the climate change interagency task force mandated by the Public Resources Code section) and has briefed the Joint Agency Climate Team regarding the development of the greenhouse gas regulation.

6 ACTIONS TAKEN BY THE CALIFORNIA CLIMATE ACTION REGISTRY

Section 43018.5(f) states that the California Climate Action Registry shall adopt procedures for reporting GHG reductions from mobile sources by July 1, 2003. To meet this statutory requirement, the Registry Board adopted the following policies on March 5th, 2003.

For purposes of a Registry participant's in-use mobile source emissions, "annual reductions/increases" shall be defined as the decrease/increase in total GHG emissions from mobile sources that are registered from one year to the next as calculated in the General Reporting Protocol.

The Registry is collaborating with the California Air Resources Board (ARB), the California Energy Commission (CEC), and the interagency task force to help develop, adopt, and implement GHG emissions regulations applicable to new motor vehicles offered for sale within California. "Annual reductions/increases", as it applies to emissions from vehicles produced by manufacturers to be offered for sale within California, shall be developed through the California Air Resources Board regulatory process and presented to the Registry for consideration at a future date. At that time, the Registry will modify its guidance to reflect ARB's rulemaking.

7 IMPACT OF THE REGULATION ON COMMUNITIES

AB 1493 directs the Board to analyze the impact of the regulation on communities in the state with the most significant exposure to air contaminants or toxic air contaminants, or both, including, but not limited to, communities with minority populations or low-income populations, or both.

The ARB has made the achievement of environmental justice an integral part of its activities. State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. The Board approved Environmental Justice Policies and Actions (Policies) on December 13, 2001. These Policies establish a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law. The Policies apply to all communities in California, but recognize that environmental justice issues have generally been raised in the context of low-income and minority communities.

As the ARB developed the climate change regulation, staff worked closely with community leaders involved with environmental justice as well as with environmental and public health organizations to maintain an ongoing dialogue and thus successfully implement the ARB's environmental justice policies. In order to accomplish the Board's over-arching goals, the ARB has actively engaged communities with environmental justice concerns.

7.1 Environmental Impacts

Staff has not identified any mechanisms by which the climate change regulation would result in a disproportionate negative environmental impact on low income or minority communities. In fact, the reduced emissions from the distribution and marketing of gasoline are likely to provide benefits to these communities. Many of the necessary distribution and marketing facilities are located in low income and minority communities. Distribution of petroleum takes place along freeway corridors near communities often identified with environmental justice concerns.

7.2 Economic Impacts

Staff evaluated the economic effects of the climate change regulation on low-income and minority communities. For residents in these communities who purchase new vehicles, the economic effects of the regulation would be no different than in any other community. However, because residents in low-income communities tend to purchase used vehicles at a higher rate than residents in middle and high income communities, staff evaluated the effects of the regulation on the used vehicle market and, more specifically, on residents in low-income communities that purchase used vehicles.

The climate change regulation is likely to require changes in vehicle technology that will increase the price of new vehicles sold in California. This increase in turn is expected to

increase the price of used vehicles. Typical California low-income households will be affected by the climate change regulation to the extent that the implementation of the regulation would alter their disposable income. Staff estimated that the increase in annual costs of used vehicles will be about 0.3 percent of the annual family income of \$15,000 for a low-income household. This represents a minor change in the average income of typical low-income households.

Staff also assessed the potential impact of the regulation on the monthly cash flow of typical low-income purchasers of used vehicles, using a vehicle-financing period of three years at an interest rate of 10 percent. The regulation is expected to increase the average monthly vehicle payment for a typical low-income household by about \$8 for the PC/LDT1 category and \$11 for the LDT2 category. Concurrently, typical low-income consumers would benefit from monthly operating cost savings ranging from about \$14 (PC/LDT1), to \$15 (LDT2), resulting in a net monthly savings of \$4 to \$6.

As discussed in section 5.2.E above, staff also evaluated the broader impacts of the regulation on job and business creation in representative San Diego communities with environmental justice concerns. The evaluation concluded that the regulation would likely result in an increase in jobs and business creation.

8 CONCLUSION

The approved regulation complies with the legislative mandate. The staff has been careful throughout the development of the regulation to incorporate every consideration that is required by AB 1493 and to avoid those measures that are prohibited by the statutory language. The regulation is good for public health and the environment, good for the California economy, and good for consumers. It reduces greenhouse gases and smog forming emissions, it increases jobs and personal income statewide, it preserves consumer choice, and it results in a net savings for consumers.

APPENDIX A: REGULATORY TEXT

This section presents the text of the regulatory language approved at the September 24 hearing, as modified at Board direction.

GREENHOUSE GAS REGULATION ORDER

As Proposed October 19, 2004

Amendments to Sections 1900 and 1961, and Adoption of new Section 1961.1, Title 13, California Code of Regulations

§ 1900. Definitions.

(a) [No change.]

(b) In addition to the definitions incorporated under subdivision (a), the following definitions shall govern the provisions of this chapter.

Definitions (b)(1) through (7). [No change.]

(8) “Independent low volume manufacturer” means a manufacturer with California annual sales of less than 10,000 new passenger cars, light-duty trucks and medium-duty vehicles following aggregation of sales pursuant to this section 1900(b)(8). Annual sales shall be determined as the average number or sales sold for the three previous consecutive model years for which a manufacturer seeks certification; however, for a manufacturer certifying for the first time in California, annual sales shall be based on projected California sales for the model year. A manufacturer’s California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer’s nameplate shall be treated as California sales of the marketing manufacturer. The annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

(9) “Intermediate volume manufacturer” means any pre-2001 model year manufacturer with California sales between 3,001 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the manufacturer each model year from 1989 to 1993; any 2001 through 2002 model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the manufacturer each model year from 1989 to 1993; and any 2003 and

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subsequent model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. For purposes of applying the 2005 and subsequent model year zero-emission vehicle requirements for intermediate-volume manufacturers under section 1962(b), the annual sales from different firms shall be aggregated in the case of (1) vehicles produced by two or more firms, each one of which either has a greater than 50% equity ownership in another or is more than 50% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 50% in each firm.

For purposes of applying the 2009 and subsequent model year Greenhouse Gas requirements for intermediate volume manufacturers under section 1961.1, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, each one of which either has a greater than 10% equity ownership in another or is more than 10% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 10% in each firm.

(10) "Large volume manufacturer" means any 2000 and subsequent model year manufacturer that is not a small volume manufacturer, or an independent low volume manufacturer, or an intermediate volume manufacturer.

(11) "Light-duty truck" means any 2000 and subsequent model motor vehicle certified to the standards in section 1961(a)(1) rated at 8,500 pounds gross vehicle weight or less, and any other motor vehicle rated at 6,000 pounds gross vehicle weight or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

(12) "Medium-duty passenger vehicle" means any medium-duty vehicle with a gross vehicle weight rating of less than 10,000 pounds that is designed primarily for the transportation of persons. The medium-duty passenger vehicle definition does not include any vehicle which: (1) is an "incomplete truck" i.e., is a truck that does not have the primary load carrying device or container attached; or (2) has a seating capacity of more than 12 persons; or (3) is designed for more than 9 persons in seating rearward of the driver's seat; or (4) is equipped with an open cargo area of 72.0 inches in interior length or more. A covered box not readily accessible from the passenger compartment will be considered an open cargo area, for purposes of this definition.

(13) "Medium-duty vehicle" means any pre-1995 model year heavy-duty vehicle having a manufacturer's gross vehicle weight rating of 8,500 pounds or less; any 1992 through 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1960.1(h)(2) having a manufacturer's gross vehicle

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weight rating of 14,000 pounds or less; any 1995 through 2003 model year heavy-duty vehicle certified to the standards in section 1960.1(h)(1) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in Section 1961(a)(1) or 1962 having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

(14) "Modified part" means any aftermarket part intended to replace an original equipment emission-related part and which is not functionally identical to the original equipment part in all respects which in any way affect emissions, excluding a consolidated part.

(15) "Motorcycle engine" means an engine which is used to propel a new, street-use motorcycle.

(16) [Reserved.]

(17) "Passenger car" means any motor vehicle designed primarily for transportation of persons and having a design capacity of twelve persons or less.

(18) "Reactivity adjustment factor" means a fraction applied to the NMOG emissions from a vehicle powered by a fuel other than conventional gasoline for the purpose of determining a gasoline-equivalent NMOG level. The reactivity adjustment factor is defined as the ozone-forming potential of clean fuel vehicle exhaust divided by the ozone-forming potential of gasoline vehicle exhaust.

(19) "Recall" means:
Subparagraphs (16)(A) and (B). [No change.]

(20) "Replacement part" means any aftermarket part intended to replace an original equipment emissions-related part and which is functionally identical to the original equipment part in all respects which in any way affect emissions (including durability), or a consolidated part.

(21) "Subgroup" means a set of vehicles within an engine family distinguishable by characteristics contained in the manufacturer's application for certification.

(22) "Small volume manufacturer" means, with respect to the 2001 and subsequent model-years, a manufacturer with California sales less than 4,500 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification as a small volume manufacturer; however, for manufacturers certifying for the first time in California model-year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. Except as provided in the next paragraph,

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beginning with the 2009 model year, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

For purposes of compliance with the zero-emission vehicle requirements, heavy-duty vehicles and engines shall not be counted as part of a manufacturer's sales. For purposes of applying the 2005 and subsequent model year zero-emission vehicle requirements for small-volume manufacturers under section 1962(b), the annual sales from different firms shall be aggregated in the case of (1) vehicles produced by two or more firms, each one of which either has a greater than 50% equity ownership in another or is more than 50% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 50% in each firm.

Note: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, and 43104 Health and Safety Code.
Reference: Sections 39002, 39003, 39010, 39500, 40000, 43000, 43013, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43106, and 43204, Health and Safety Code.

§ 1961. Exhaust Emission Standards and Test Procedures - 2004 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

Introduction. [No change.]

Sections (a) through (c). [No change.]

(d) *Test Procedures.* The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the “California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” as amended ~~May 28, 2004~~ [INSERT DATE OF AMENDMENT], and the “California Non-Methane Organic Gas Test Procedures,” as amended July 30, 2002, which are incorporated herein by reference. In the case of hybrid electric vehicles and on-board fuel-fired heaters, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the “California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes,” incorporated by reference in section 1962.

Section (e). [No change.]

Note: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, and 43205, Health and Safety Code.

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Adopt new Section 1961.1, Title 13, Article 2, within Chapter 1, Division 3, California Code of Regulations, to read as follows: (Note: the entire text of section 1961.1 set forth below is new language proposed to be added to the California Code of Regulations.)

§ 1961.1. Greenhouse Gas Exhaust Emission Standards and Test Procedures - 2009 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

(a) *Greenhouse Gas Emission Requirements.* The greenhouse gas emission levels from new 2009 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles shall not exceed the following requirements. Light-duty trucks from 3751 lbs. LVW – 8500 lbs. GVW that are certified to the Option 1 LEV II NOx Standard in section 1961(a)(1) are exempt from these greenhouse gas emission requirements, however, passenger cars, light-duty trucks 0-3750 lbs. LVW, and medium-duty passenger vehicles are not eligible for this exemption.

(1) *Fleet Average Greenhouse Gas Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.*

(A) The fleet average greenhouse gas exhaust mass emission values from passenger cars, light-duty trucks, and medium-duty passenger vehicles that are produced and delivered for sale in California each model year by a large volume manufacturer shall not exceed:

FLEET AVERAGE GREENHOUSE GAS EXHAUST MASS EMISSION REQUIREMENTS FOR PASSENGER CAR, LIGHT-DUTY TRUCK, AND MEDIUM- DUTY PASSENGER VEHICLE WEIGHT CLASSES¹ (4,000 mile Durability Vehicle Basis)		
<i>Model Year</i>	<i>Fleet Average Greenhouse Gas Emissions (grams per mile CO₂-equivalent)</i>	
	<i>All PCs; LDTs 0-3750 lbs. LVW</i>	<i>LDTs 3751 lbs. LVW - 8500 lbs. GVW; MDPVs</i>
2009	323	439
2010	301	420
2011	267	390
2012	233	361
2013	227	355
2014	222	350
2015	213	341
2016+	205	332

¹ Each manufacturer shall demonstrate compliance with these values in accordance with section 1961.1(a)(1)(B).

(B) *Calculation of Fleet Average Greenhouse Gas Value.*

1. *Basic Calculation.*

a. Each manufacturer shall calculate both a “city” grams per mile average CO₂-equivalent value for each GHG vehicle test group and a “highway” grams per mile average CO₂-equivalent value for each GHG vehicle test group, including vehicles certified in accordance with section 1960.5 and vehicles certified in accordance with section 1961(a)(14), using the following formula. Greenhouse Gas emissions used for the “city” CO₂-equivalent value calculation shall be measured using the “FTP” test cycle (40 CFR, Part 86, Subpart B). Greenhouse Gas emissions used for the “highway” CO₂-equivalent value calculation shall be based on emissions measured using the Highway Test Procedures.

$$\text{CO}_2\text{-Equivalent Value} = \text{CO}_2 + 296 \times \text{N}_2\text{O} + 23 \times \text{CH}_4 - \text{A/C Direct Emissions Allowance} - \text{A/C Indirect Emissions Allowance}$$

A manufacturer may use N₂O = 0.006 grams per mile in lieu of measuring N₂O exhaust emissions.

b. *A/C Direct Emissions Allowance.* A manufacturer may use the following A/C Direct Emission Allowances, upon approval of the Executive Officer, if that manufacturer demonstrates that the following requirements are met. Such demonstration shall include specifications of the components used and an engineering evaluation that verifies the estimated lifetime emissions from the components and the system. A manufacturer shall also provide confirmation that the number of fittings and joints has been minimized and components have been optimized to minimize leakage. No A/C Direct Emissions Allowance is permitted if the following requirements are not met.

- i. A “low-leak air conditioning system” shall be defined as one that meets all of the following criteria:
 - A. All pipe and hose connections are equipped with multiple o-rings, seal washers, or metal gaskets only (e.g., no single o-rings);
 - B. All hoses in contact with the refrigerant must be ultra-low permeability barrier or veneer hose on both the high-pressure and the low-pressure sides of the system (e.g., no rubber hoses); and
 - C. Only multiple-lip compressor shaft seals shall be used (with either compressor body o-rings or gaskets).
- ii. For an air conditioning system that uses HFC-134a as the refrigerant:
 - A. An A/C Direct Emissions Allowance of 3.0 CO₂-equivalent grams per mile shall apply if the system meets the criteria for a “low-leak air conditioning system.”
 - B. An A/C Direct Emissions Allowance of 3.0 CO₂-equivalent grams per mile shall apply if the manufacturer demonstrates alternative technology that achieves equal or lower direct emissions than a “low-leak air conditioning system.”
 - C. An A/C Direct Emissions Allowance greater than 3.0 CO₂-equivalent grams per mile may apply for an air conditioning system that reduces refrigerant leakage further than would be obtained from a “low-leak air conditioning system.” A maximum A/C Direct Emissions Allowance of 6.0 CO₂-equivalent grams per mile may be earned for an air conditioning system that has 100 percent containment of refrigerant during “normal operation.” To obtain an A/C Direct Emissions Allowance greater than 3.0 CO₂-equivalent grams per mile, the manufacturer must provide an engineering evaluation that supports the allowance requested.
- iii. For an air conditioning system that uses HFC-152a, CO₂ refrigerant, or any refrigerant with a GWP of 150 or less:
An A/C Direct Emissions Allowance shall be calculated using the following formula:

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$$\text{A/C Direct Emissions Allowance} = A - (B \times C)$$

where: A = 9 CO₂-equivalent grams per mile (the lifetime vehicle emissions expected from an air conditioning system that uses refrigerant HFC-134a);

$$B = 9 \text{ CO}_2 - \text{equivalent g/mi} \times \frac{\text{GWP}}{1300}$$

where: B is the lifetime vehicle emissions expected from an air conditioning system that uses a refrigerant with a GWP of 150 or less, and

“GWP” means the GWP of this refrigerant; and

C = 1, except for an air conditioning system that meets the criteria of a “low-leak air conditioning system.”

For an air conditioning system that meets or exceeds the criteria of a “low-leak air conditioning system,” the following formula shall apply:

$$C = 1 - (0.12 \times \text{credit})$$

where: “credit” equals 3.0 CO₂-equivalent grams per mile for a “low-leak air conditioning system” that meets the criteria of section 1961.1(a)(1)(B)1.b.i., or

“credit” equals a value greater than 3.0 CO₂-equivalent grams per mile for an air conditioning system that reduces refrigerant leakage further than would be obtained from a “low-leak air conditioning system.” A maximum credit of 6.0 CO₂-equivalent grams per mile may be earned for an air conditioning system that has 100 percent containment of refrigerant during normal operation. To obtain a credit greater than 3.0 CO₂-equivalent grams per mile, the manufacturer must provide an engineering evaluation that supports the credit requested.

c. *A/C Indirect Emissions Allowance.* A manufacturer may use the following A/C Indirect Emissions Allowances, upon approval of the Executive Officer, if the manufacturer demonstrates using data or an engineering evaluation that the air conditioning system meets the following requirements. A manufacturer may use the following A/C Indirect Emissions Allowances for other technologies, upon approval of the Executive Officer, if that manufacturer demonstrates that the air conditioning system achieves equal or greater CO₂-equivalent grams per mile emissions reductions.

i. An “A/C system with reduced indirect emissions” shall be defined as one that meets all of the following criteria:

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- A. Has managed outside and recirculated air balance to achieve comfort, demisting, and safety requirements, based on such factors as temperature, humidity, pressure, and level of fresh air in the passenger compartment to minimize compressor usage;
 - B. Is optimized for energy efficiency by utilizing state-of-the-art high efficiency evaporators, condensers, and other components; and
 - C. Has an externally controlled compressor (such as an externally controlled variable displacement or variable speed compressor or an externally controlled fully cycling fixed displacement compressor) that adjusts evaporative temperature to minimize the necessity of reheating cold air to satisfy occupant comfort.
- ii. For an A/C system that meets all of the criteria for an "A/C system with reduced indirect emissions," the allowance shall be calculated using the following emission factors, up to a maximum allowance of 9.0 CO₂-equivalent grams per mile if the system has one evaporator and up to a maximum allowance of 11.0 CO₂-equivalent grams per mile if the system has two evaporators:
- A. 5.0 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that does not use CO₂ as the refrigerant
 - B. 27.5 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that uses CO₂ as the refrigerant
- iii. For an air conditioning system equipped with a refrigerant having a GWP of 150 or less, the allowance shall be calculated using the following emission factors, up to a maximum allowance of 0.5 CO₂-equivalent grams per mile:
- A. 0.2 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that does not use CO₂ as the refrigerant and
 - B. 1.1 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that uses CO₂ as the refrigerant.

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d. *Upstream Greenhouse Gas Emission Adjustment Factors for Alternative Fuel Vehicles.* A grams per mile average CO₂-equivalent value for each GHG vehicle test group certifying on a fuel other than conventional gasoline, including vehicles certified in accordance with section 1960.5 and vehicles certified in accordance with section 1961(a)(14), shall be calculated as follows:

$$(\text{CO}_2 + \text{A/C Indirect Emissions}) \times (\text{Fuel Adjustment Factor}) + 296 \times \text{N}_2\text{O} + 23 \times \text{CH}_4 + \text{A/C Direct Emissions}$$

where:

$$\text{A/C Indirect Emissions} = \text{A} - \text{B}$$

where: “A” represents the indirect emissions associated with an A/C system that does not incorporate any of the A/C improvements described in section 1961.1(a)(1)(B)1.c. A is determined by the following emission factors, with a maximum value of 17.0 CO₂-equivalent grams per mile for a system that has one evaporator and a maximum value of 21.0 CO₂-equivalent grams per mile for a system that has two evaporators.

A = 9.6 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for an A/C system that does not use CO₂ as the refrigerant or

A = 52.8 CO₂-equivalent grams per mile per 100 cc of maximum compressor displacement for an A/C system that uses CO₂ as the refrigerant.

B = A/C Indirect Emissions Allowance as calculated per section 1961.1(a)(1)(B)1.c.

A/C Direct Emissions = 9 CO₂-equivalent grams per mile – A/C Direct Emissions Allowance as calculated per section 1961.1(a)(1)(B)1.b.

The Fuel Adjustment Factors are:

Fuel	Fuel Adjustment Factor
Natural Gas	1.03
LPG	0.89
E85	0.74

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e. *Calculation of CO₂-Equivalent Emissions for Hydrogen Internal Combustion Engine Vehicles and for Electric and Hydrogen ZEVs.* The grams per mile average CO₂-equivalent value for each GHG vehicle test group certifying to ZEV standards, including vehicles certified in accordance with section 1960.5 and vehicles certified in accordance with section 1961(a)(14), shall be:

$$\text{A/C Direct Emissions} + \text{Upstream Emissions Factor}$$

where: $\text{A/C Direct Emissions} = 9 \text{ CO}_2\text{-equivalent grams per mile} - \text{A/C Direct Emissions Allowance as calculated per section 1961.1(a)(1)(B)1.b.}$

The Upstream Emissions Factors are:

Vehicle Type	Upstream Emissions Factor ¹ (CO ₂ -equivalent g/mi)
Electric ZEV	130
Hydrogen Internal Combustion Engine Vehicle	290
Hydrogen ZEV	210

¹The Executive Officer may approve use of a lower upstream emissions factor if a manufacturer demonstrates the appropriateness of the lower value by providing information that includes, but is not limited to, the percentage of hydrogen fuel or the percentage of electricity produced for sale in California using a "renewable energy resource."

2. *Calculation of Greenhouse Gas Values for Bi-Fuel Vehicles, Fuel-Flexible Vehicles, Dual-Fuel Vehicles, and Grid-connected Hybrid Electric Vehicles.* For bi-fuel, fuel-flexible, dual-fuel, and grid-connected hybrid electric vehicles, a manufacturer shall calculate a grams per mile average CO₂-equivalent value for each GHG vehicle test group, in accordance with section 1961.1(a)(1)(B)1., based on exhaust mass emission tests when the vehicle is operating on gasoline.

a. *Optional Alternative Compliance Mechanisms.* Beginning with the 2010 model year, a manufacturer that demonstrates that a bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric GHG vehicle test group will be operated in use in California on the alternative fuel shall be eligible to certify those vehicles using this optional alternative compliance procedure, upon approval of the Executive Officer.

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i. To demonstrate that bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric vehicles within a GHG vehicle test group will be operated in use in California on the alternative fuel, the manufacturer shall provide data that shows the previous model year sales of such vehicles to fleets that provide the alternative fuel on-site or, for grid-connected hybrid electric vehicles, to end users with the capability to recharge the vehicle on-site. This data shall include both the total number of vehicles sales that were made to such fleets or end users with the capability to recharge the vehicle on-site and as the percentage of total GHG vehicle test group sales. The manufacturer shall also provide data demonstrating the percentage of total vehicle miles traveled by the bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric vehicles sold to each fleet or to end users with the capability to recharge the vehicle on-site in the previous model year using the alternative fuel and using gasoline.

ii. For each GHG vehicle test group that receives approval by the Executive Officer under section 1961(a)(1)(B)2.a.i., a grams per mile CO₂-equivalent value shall be calculated as follows:

$$\text{CO}_2\text{-equivalent value} = [A \times E \times B \times C] + [(1 - (A \times E \times B)) \times D]$$

where: A = the percentage of previous model year vehicles within a GHG vehicle test group that were operated in use in California on the alternative fuel during the previous calendar year;

B = the percentage of miles traveled by "A" during the previous calendar year ;

C = the CO₂-equivalent value for the GHG vehicle test group, as calculated in section 1961.1(a)(1)(B)1, when tested using the alternative fuel;

D = the CO₂-equivalent value for the GHG vehicle test group, as calculated in section 1961.1(a)(1)(B)1, when tested using gasoline; and

E = 0.9 for grid-connected hybrid electric vehicles or

E = 1 for bi-fuel, fuel-flexible, and dual-fuel vehicles.

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The Executive Officer may approve use of a higher value for “E” for a grid-connected hybrid electric vehicle GHG vehicle test group if a manufacturer demonstrates that the vehicles can reasonably be expected to maintain more than 90 percent of their original battery capacity over a 200,000 mile vehicle lifetime. The manufacturer may demonstrate the appropriateness of a higher value either by providing data from real world vehicle operation; or by showing that these vehicles are equipped with batteries that do not lose energy storage capacity until after 100,000 miles; or by offering 10 year/150,000 mile warranties on the batteries.

iii. For the first model year in which a grid-connected hybrid electric vehicle model is certified for sale in California, the manufacturer may estimate the sales and percentage of total vehicle miles traveled information requested in section 1961.1(a)(1)(B)2.a.i. in lieu of providing actual data, and provide final sales data and data demonstrating the percentage of total vehicle miles traveled using electricity by no later than March 1 of the calendar year following the close of the model year.

3. *Calculation of Fleet Average Greenhouse Gas Values.*

a. Each manufacturer’s PC and LDT1 fleet average Greenhouse Gas value for the total number of PCs and LDT1s produced and delivered for sale in California, including vehicles certified in accordance with section 1960.5 and vehicles certified in accordance with section 1961(a)(14), shall be calculated as follows:

$$[0.55 \times (\Sigma \text{ City Test Group Greenhouse Gas Values}) + 0.45 \times (\Sigma \text{ Highway Test Group Greenhouse Gas Values})] \div \text{Total Number of PCs and LDT1s Produced, Including ZEVs and HEVs}$$

where: City Test Group Greenhouse Gas Value = $[(\text{Total Number of Vehicles in a Test Group} - \Sigma \text{ Number of Vehicles in Optional GHG Test Vehicle Configurations}) \times \text{“worst-case” calculated CO}_2\text{-equivalent value} + \Sigma (\text{Number of vehicles in Optional GHG Test Vehicle Configurations} \times \text{applicable calculated CO}_2\text{-equivalent value})]$ measured using the FTP test cycle; and

Highway Test Group Greenhouse Gas Value = $[(\text{Total Number of Vehicles in a Test Group} - \Sigma \text{ Number of Vehicles in Optional GHG Test Vehicle Configurations}) \times \text{“worst-case” calculated CO}_2\text{-equivalent value} + \Sigma (\text{Number of vehicles in Optional GHG Test Vehicle Configurations} \times \text{applicable calculated CO}_2\text{-equivalent value})]$ measured using the Highway Test Procedures.

b. Each manufacturer’s LDT2 and MDPV fleet average Greenhouse Gas value for the total number of LDT2s and MDPVs produced and delivered for sale in California, including vehicles certified in accordance with section 1960.5 and vehicles certified in accordance with section 1961(a)(14), shall be calculated as follows:

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$$[0.55 \times (\Sigma \text{ City Test Group Greenhouse Gas Values}) + 0.45 \times (\Sigma \text{ Highway Test Group Greenhouse Gas Values})] \div \text{Total Number of LDT2s and MDPVs Produced, Including ZEVs and HEVs}$$

where: City Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x “worst-case” calculated CO₂-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO₂-equivalent value)] measured using the FTP test cycle; and

Highway Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x “worst-case” calculated CO₂-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO₂-equivalent value)] measured using the Highway Test Procedures.

(C) *Requirements for Intermediate Volume Manufacturers.*

1. Before the 2016 model year, compliance with this section 1961.1 shall be waived for intermediate volume manufacturers.

2. For each intermediate volume manufacturer, the manufacturer’s baseline fleet average greenhouse gas value for PCs and LDT1s and baseline fleet average greenhouse gas value for LDT2s and MDPVs shall be calculated, in accordance with section 1961.1(a)(1)(B) using its 2002 model year fleet.

3. In 2016 and subsequent model years, an intermediate volume manufacturer shall either:

- a. not exceed a fleet average greenhouse gas emissions value of 233 g/mi for PCs and LDT1s and 361 g/mi for LDT2s and MDPVs, or
- b. not exceed a fleet average greenhouse gas value of 0.75 times the baseline fleet average greenhouse gas value for PCs and LDT1s and 0.82 times the baseline fleet average greenhouse gas value for LDT2s and MDPVs, as calculated in section 1961.1(a)(1)(C)2.

4. If a manufacturer's average annual California sales exceed 60,000 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as a intermediate volume manufacturer and shall comply with the fleet average requirements applicable to large volume manufacturers as specified in section 1961.1(a)(1) beginning with the fourth model year after the last of the three consecutive model years.

5. If a manufacturer’s average annual California sales fall below 60,001 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall be treated as a intermediate volume manufacturer and shall be subject to the requirements for intermediate volume manufacturers beginning with the next model year.

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(D) *Requirements for Small Volume Manufacturers and Independent Low Volume Manufacturers.*

1. Before the 2016 model year, compliance with this section 1961.1 shall be waived for small volume manufacturers and independent low volume manufacturers.

2. At the beginning of the 2013 model year, each small volume manufacturer and independent low volume manufacturer shall identify all 2012 model year vehicle models, certified by a large volume manufacturer that are comparable to that small volume manufacturer or independent low volume manufacturer's 2016 model year vehicle models, based on horsepower and horsepower to weight ratio. The small volume manufacturer and independent low volume manufacturer shall demonstrate to the Executive Officer the appropriateness of each comparable vehicle model selected. Upon approval of the Executive Officer, s/he shall provide to the small volume manufacturer and to the independent low volume manufacturer the CO₂-equivalent value for each 2012 model year vehicle model that is approved. The small volume manufacturer and independent low volume manufacturer shall calculate an average greenhouse gas emissions value for each its greenhouse gas vehicle test groups based on the CO₂-equivalent values provided by the Executive Officer.

3. In the 2016 and subsequent model years, a small volume manufacturer and an independent low volume manufacturer shall either:

a. not exceed the fleet average greenhouse gas emissions value calculated for each GHG vehicle test group for which a comparable vehicle is sold by a large volume manufacturer, in accordance with section 1961.1(a)(1)(D)2; or

b. not exceed a fleet average greenhouse gas emissions value of 233 g/mi for PCs and LDT1s and 361 g/mi for LDT2s and MDPVs; or

c. upon approval of the Executive Officer, if a small volume manufacturer demonstrates a vehicle model uses an engine, transmission, and emission control system that is identical to a configuration certified for sale in California by a large volume manufacturer, those small volume manufacturer vehicle models are exempt from meeting the requirements in paragraphs 3.a. and b. of this section.

4. If a manufacturer's average annual California sales exceed 4,500 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume manufacturer and shall comply with the fleet average requirements applicable to larger volume manufacturers as specified in section 1961.1(a)(1) beginning with the fourth model year after the last of the three consecutive model years.

5. If a manufacturer's average annual California sales exceed 10,000 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as an independent low volume manufacturer and shall comply with the fleet average requirements

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applicable to larger volume manufacturers as specified in section 1961.1(a)(1) beginning with the fourth model year after the last of the three consecutive model years.

6. If a manufacturer's average annual California sales fall below 4,501 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall be treated as a small volume manufacturer and shall be subject to the requirements for small volume manufacturers beginning with the next model year.

(b) *Calculation of Greenhouse Gas Credits/Debits.*

(1) *Calculation of Greenhouse Gas Credits for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.*

(A) In the 2000 through 2008 model years, a manufacturer that achieves fleet average Greenhouse Gas values lower than the fleet average Greenhouse Gas requirement applicable to the 2012 model year shall receive credits for each model year in units of g/mi determined as:

$$\begin{aligned} &[(\text{Fleet Average Greenhouse Gas Requirement for the 2012 model year}) \\ &\quad - (\text{Manufacturer's Fleet Average Greenhouse Gas Value})] \\ &\quad \times (\text{Total No. of Vehicles Produced and Delivered for Sale} \\ &\quad \quad \text{in California, Including ZEVs and HEVs}). \end{aligned}$$

(B) In 2009 and subsequent model years, a manufacturer that achieves fleet average Greenhouse Gas values lower than the fleet average Greenhouse Gas requirement for the corresponding model year shall receive credits in units of g/mi Greenhouse Gas determined as:

$$\begin{aligned} &[(\text{Fleet Average Greenhouse Gas Requirement}) - (\text{Manufacturer's Fleet Average} \\ &\quad \text{Greenhouse Gas Value})] \times (\text{Total No. of Vehicles Produced and Delivered for Sale} \\ &\quad \quad \text{in California, Including ZEVs and HEVs}). \end{aligned}$$

(2) A manufacturer with 2009 and subsequent model year fleet average Greenhouse Gas values greater than the fleet average requirement for the corresponding model year shall receive debits in units of g/mi Greenhouse Gas equal to the amount of negative credits determined by the aforementioned equation. For the 2009 and subsequent model years, the total g/mi Greenhouse Gas credits or debits earned for PCs and LDT1s and for LDT2s and MDPVs shall be summed together. The resulting amount shall constitute the g/mi Greenhouse Gas credits or debits accrued by the manufacturer for the model year.

(3) *Procedure for Offsetting Greenhouse Gas Debits.*

(A) A manufacturer shall equalize Greenhouse Gas emission debits by earning g/mi Greenhouse Gas emission credits in an amount equal to the g/mi Greenhouse Gas debits, or by submitting a commensurate amount of g/mi Greenhouse Gas credits to the Executive Officer that

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were earned previously or acquired from another manufacturer. A manufacturer shall equalize Greenhouse Gas debits for PCs, LDTs, and MDPVs within five model years after they are earned. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of passenger cars and LDT1s not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year by the g/mi Greenhouse Gas fleet average requirement for PCs and LDTs 0-3750 lbs. LVW applicable for the model year in which the debits were first incurred. For the purposes of Health and Safety Code section 43211, the number of LDT2s and MDPVs not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year by the g/mi Greenhouse Gas fleet average requirement for LDTs 3751 lbs. LVW – 8500 lbs. GVW and MDPVs applicable for the model year in which the debits were first incurred.

(B) Greenhouse Gas emission credits earned in the 2000 through 2008 model years shall be treated as if they were earned in the 2011 model year and shall retain full value through the 2012 model year. Greenhouse Gas emission credits earned in the 2009 and subsequent model years shall retain full value through the fifth model year after they are earned. The value of any credits earned in the 2000 through 2008 model years that are not used to equalize debits accrued in the 2009 through 2012 model years shall be discounted by 50% at the beginning of the 2013 model year, shall be discounted to 25% of its original value if not used by the beginning of the 2014 model year, and will have no value if not used by the beginning of the 2015 model year. Any credits earned in the 2009 and subsequent model years that are not used by the end of the fifth model year after they are accrued shall be discounted by 50% at the beginning of the sixth model year after being earned, shall be discounted to 25% of its original value if not used by the beginning of the seventh model year after being earned, and will have no value if not used by the beginning of the eighth model year after being earned.

(c) *Test Procedures.* The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in section 1961(d). In the case of hybrid electric vehicles and on-board fuel-fired heaters, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section 1962.

(d) *Abbreviations.* The following abbreviations are used in this section 1961.1:

"cc" mean cubic centimeters.

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"CH₄" means methane.
"CO₂" means carbon dioxide.
"E85" means a blend of 85 percent ethanol and 15 percent gasoline.
"FTP" means Federal Test Procedure.
"GHG" means greenhouse gas.
"g/mi" means grams per mile.
"GVW" means gross vehicle weight.
"GVWR" means gross vehicle weight rating.
"GWP" means the global warming potential.
"HEV" means hybrid-electric vehicle.
"LDT" means light-duty truck.
"LDT1" means a light-duty truck with a loaded vehicle weight of 0-3750 pounds.
"LDT2" means a "LEV II" light-duty truck with a loaded vehicle weight of 3751 pounds to a gross vehicle weight of 8500 pounds.
"LEV" means low-emission vehicle.
"LPG" means liquefied petroleum gas.
"LVW" means loaded vehicle weight.
"MDPV" means medium-duty passenger vehicle.
"MDV" means medium-duty vehicle.
"mg/mi" means milligrams per mile.
"N₂O" means nitrous oxide.
"PC" means passenger car.
"SULEV" means super-ultra-low-emission vehicle.
"ULEV" means ultra-low-emission vehicle.
"ZEV" means zero-emission vehicle.

(e) *Definitions Specific to this Section.* The following definitions apply to this section 1961.1:

- (1) "A/C Direct Emissions" means any refrigerant released from a motor vehicle's air conditioning system.
- (2) "A/C Indirect Emissions" means any increase in motor vehicle exhaust CO₂ emissions that can be attributed to the operation of the air conditioning system.
- (3) "GHG Vehicle Test Group" means vehicles that have an identical test group, vehicle make and model, transmission class and driveline, aspiration method (e.g., naturally aspirated, turbocharged), camshaft configuration, valvetrain configuration, and inertia weight class.
- (4) "Greenhouse Gas" means the following gases: carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons.
- (5) "Grid-Connected Hybrid Electric Vehicle" means a hybrid electric vehicle that has the capacity for the battery to be recharged from an off-board source of electricity and has some all-electric range.

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(6) “GWP” means the 100-year global warming potential specified in IPCC (Intergovernmental Panel on Climate Change) 2000: Emissions Scenarios. N. Nakicenovic et. al. editors, Special Report of Working Group III of the IPCC, Cambridge University Press, Cambridge UK, ISBN 0-521-80493-0.

(7) “Normal Operation” of an air conditioning system means typical everyday use of the A/C system to cool a vehicle. “Normal Operation” does not include car accidents, dismantling of an air conditioning system, or any other non-typical events.

(8) “Optional GHG Test Vehicle Configuration” means any GHG vehicle configuration that is selected for testing by the manufacturer as allowed by section G.2.3 of the “California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” other than the worst-case configuration.

(9) “Renewable Energy Resource” means a facility that meets all of the criteria set forth in Public Resources Code section 25741(a), except that the facility is not required to be located in California or near the border of California.

(10) “Variable Displacement Compressor” means a compressor in which the mass flow rate of refrigerant is adjusted independently of compressor speed by the control system in response to cooling load demand.

(11) “Variable Speed Compressor” means a compressor in which the mass flow rate of refrigerant can be adjusted by control of the compressor input shaft speed, independent of vehicle engine speed. For example, a variable speed compressor can have electric drive, hydraulic drive, or mechanical drive through a variable speed transmission.

(12) “Worst-Case” means the vehicle configuration within each test group that is expected to have the highest CO₂-equivalent value, as calculated in section 1961.1(a)(1)(B)1.

(f) *Severability.* Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this article remains in full force and effect.

(g) *Effective Date of this Section.* The requirements of this section 1961.1 shall become effective on January 1, 2006.

Note: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43018.5, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, 43205, and 43211, Health and Safety Code.